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FLOOD INSURANCE STUDY

ORIGINAL

COMPLETED

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CITY OF CALLAWAY, FLORIDA

BAY COUNTY

APRIL 30, 1986

Federal Emergency Management Agency

COMMUNITY NUMBER -120005

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Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

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FLOOD INSURANCE STUDY

CITY OF CALLAWAY,
BAY COUNTY,
FLORIDA

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Type 19 Flood Insurance Study is to investigate the existence and severity of flood hazards in the City of Callaway, Bay County, Florida, and to aid in the administration of the Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to revise the Flood Insurance Rate Map developed from data presented in the Type 15 Flood Insurance Study. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain management. Minimum flood plain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared by the Federal Emergency Management Agency (FEMA) for purposes of the National Flood Insurance Program. The data were identified as the best available at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. FEMA performed a cursory review and accepted the data as valid for purposes of this Flood Insurance Study and the National Flood Insurance Program. However, if better information is known to exist or has been developed since the date of this report, the information should be immediately forwarded to the Natural and Technological Hazards Division, Federal Emergency Management Agency, Atlanta, Georgia, for consideration for revision of this study.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The coastal hydrologic and hydraulic analyses for this study were obtained from the Type 19 Flood Insurance Study for the Unincorporated Areas of Bay County, Florida (Reference 1). The riverine hydrologic and hydraulic analyses for this study were obtained from the Type 15 Flood Insurance Study for the City of Callaway, Bay County, Florida (Reference 2).

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1.3 Coordination

On June 11, 1985, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the community and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Callaway, Bay County, Florida. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected based upon the extent and validity of available existing hydrologic and hydraulic data. Flooding caused by overflow of Martin Lake and Callaway Bayou Tributary within the corporate limits was studied by detailed methods.

A detailed coastal flooding analysis was performed on the complete coastline of the City of Callaway, where the flooding sources are St. Andrew Bay and East Bay.

Approximate methods of analysis were used to study all remaining areas having a potential flood hazard that did not have detailed scientific or technical data available.

2.2 Community Description

The City of Callaway is located in southeastern Bay County in northwestern Florida, approximately 5 miles southeast of Panama City, and is adjacent to the City of Parker on the southwest and the City of Springfield on the northwest. Callaway is mainly residential with a reported population of 7,154 in 1980 (Reference 3).

Much of the corporate limits of Callaway adjoins water, with East Bay on the south, Callaway Bayou on the east, and Martin Lake on the northwest. Callaway Bayou Tributary flows south and east through the middle of the city. This combination of bays and creeks subjects Callaway to both tidal and riverine flooding.

The climate of the area is subtropical with a moderating influence from the Gulf of Mexico. The average daily temperature varies from 55 degrees Fahrenheit (F.) in January to 82 degrees F. in August. The average annual precipitation is 57.6 inches.

2.3 Principal Flood Problems

Low-lying areas of Callaway are subject to periodic flooding. The most severe flooding in those areas is usually associated with tropical disturbances that produce excessive rainfall and/or high tides. High tides on East and St. Andrew Bays, south of Callaway, are controlled by the Gulf of Mexico.

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FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CALLAWAY, FL

(BAY CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

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Figure 2 shows the tracks of hurricanes affecting the Florida Panhandle from 1877 to 1975.

The basic information on hurricane tracks was taken from the maps of North Atlantic tropical cyclone tracks for the years 1871 through 1977, compiled by the National Oceanic and Atmospheric Administration (NOAA) (Reference 4).

Brief notes on the history and damages caused by hurricanes are abstracted from reports by the U.S. Army Corps of Engineers (References 5 and 6), Garriott (Reference 7), Sumner (Reference 8), and Patterson, Bailey and Paulhus (Reference 9). Additional information on hurricane history and damages, particularly for recent storms, comes from papers published in the Monthly Weather Review. The following lists significant storms affecting the panhandle in this century. Damage figures are those determined for values at the time of the storm; no attempt has been made to adjust these figures to present day values.

1915 (August 31 - September 6)

This storm made landfall near Port St. Joe with the heaviest damage occurring to the east near Apalachicola, Florida. Damage was estimated to be $40,000. Tide levels of 7.0 mean sea level (msl) were recorded at Carrabelle, Florida.

1917 (September 21 - September 29)

This storm made landfall near Fort Walton Beach with damage estimated at $270,000. Tide levels of 7.8 feet msl were recorded at Fort Barrancas, Florida.

1924 (September 13 - September 19)

Crossing the shoreline near Port St. Joe, this storm caused damage estimated at $275,000. Winds of 80 mph were recorded at Panama City, Florida.

1929 (September 21 - October 4)

The center of this storm entered the coast near Panama City. Damage from the storm was estimated at $500,000.

1936 (July 27 - August 1)

The center of this storm passed over Fort Walton Beach and Valparaiso. Damage was estimated at $150,000. Tide levels of 7 to 8 feet msl were recorded at Destin. A high-water mark of 8.4 feet msl was reported at Fort Walton Beach.

1950 Hurricane Baker (August 20 - September 1)

The center of this storm entered the coast between Pensacola, Florida, and Mobile, Alabama, with damage estimated at $550,000. Tide levels recorded during the passage of this storm include: 4.5 feet msl at Pensacola and Carrabelle; 5 feet msl at Panama City; and, 6.8 feet msl at Apalachicola.

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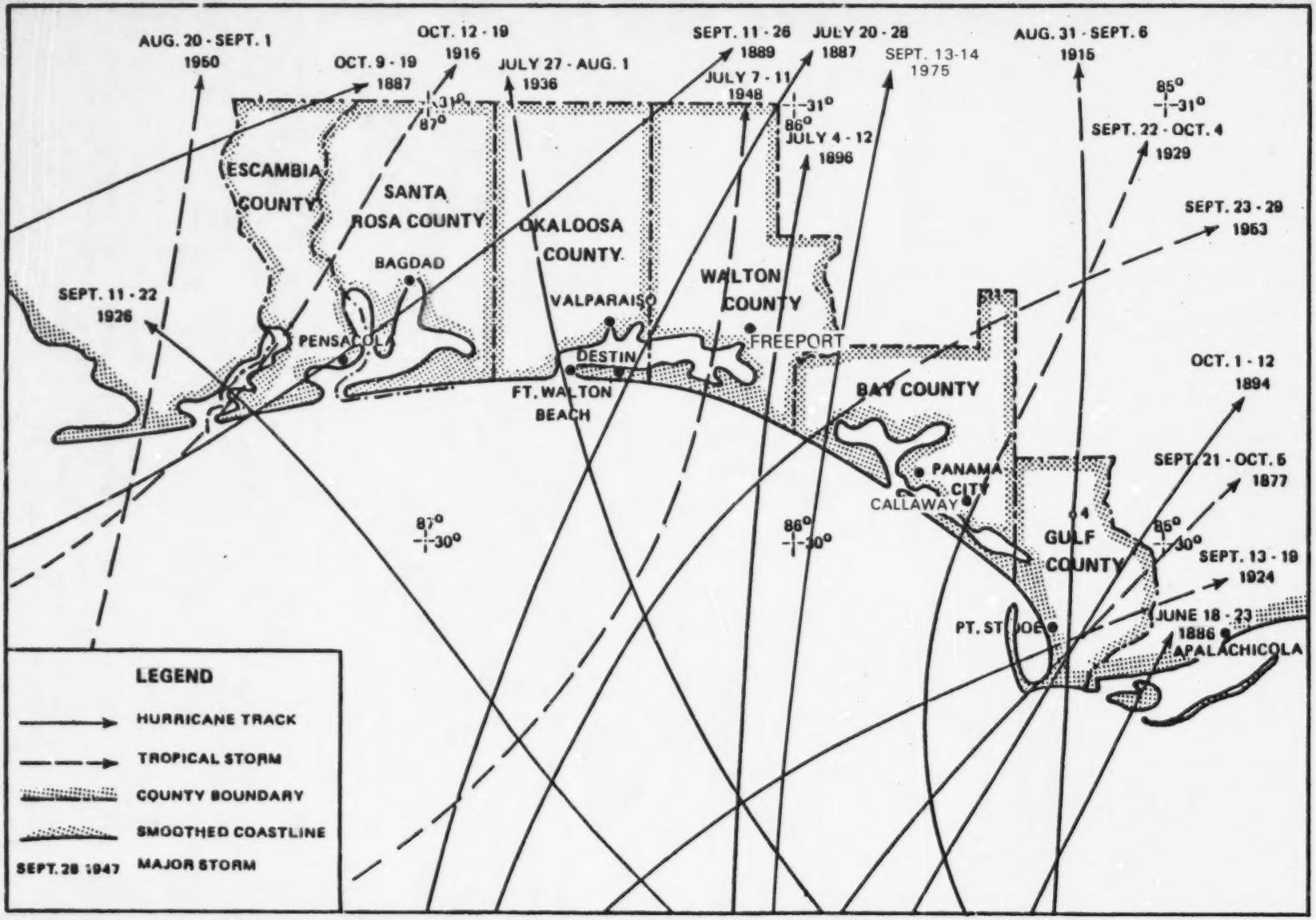

FIGURE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CALLAWAY, FL

(BAY CO.)

HISTORICAL STORM TRACKS

BAY COUNTY AND VICINITY

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1953 Hurricane Florence (September 23 - September 28)

This storm made landfall between Panama City and Fort Walton Beach with damage estimated at $150,000.

1956 Hurricane Flossy (September 21 - September 30)

This major hurricane caused extensive damage along the Louisiana, Mississippi, and Alabama coasts. Total damage was estimated at $25 million. Tide levels of 5.5 feet msl were recorded at Fort Walton Beach. Tides at Destin were estimated at 6 to 7 feet msl.

1972 Hurricane Agnes (June 14 - June 22)

This storm made landfall near Panama City. Tide levels of 8 to 9 feet msl were recorded at several points from St. George Island to Panacea, Florida.

1975 Hurricane Eloise (September 13 - September 24)

This storm made landfall about 40 miles west of Panama City. High-water marks ranging from 10 to 18 feet msl were found between Destin and Port St. Joe.

2.4 Flood Protection Measures

Flood protection measures do not exist within the study area.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community. Analyses were also carried out to establish the peak elevation-frequency relationships for each coastal flooding source studied in detail.

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Using the suggested skew from Bulletin No. 17 (Reference 10), a log-Pearson Type III frequency distribution of 20 nearby gaging stations was used to develop a regional discharge-frequency relationship. Gage records range from 10 to 47 years in length and have an average length of record of 15 years.

Peak discharges for the 10-, 50-, 100-, and 500-year floods of each riverine flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
MARTIN LAKE					
at State Road 22	3.9	440	940	1,250	2,120
CALLAWAY BAYOU TRIBUTARY					
at Berthe Avenue	4.4	480	1,020	1,350	2,280
at Cherry Street	3.4	400	860	1,140	1,940
at State Road 22	2.6	330	720	950	1,640

Inundation from St. Andrew Bay and East Bay caused by passage of storms (storm surge) was determined by the joint probability method (Reference 11). The storm populations were described by probability distributions of 5 parameters that influence surge heights. These were central pressure depression (which measures the intensity of the storm), radius to maximum winds, forward speed of the storm, shoreline crossing point, and crossing angle. These characteristics were described statistically based on an analysis of observed storms in the vicinity of the City of Callaway. Primary sources of data for this were "Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States" by NOAA (Reference 12) and "Meteorological Considerations Pertinent to Standard Project Hurricane, Atlantic and Gulf Coasts of the United States" (Reference 13). A summary of the parameters used for the area is presented in Table 2, Parameter Values for Surge Elevations.

For areas subject to flooding directly from St. Andrew Bay and East Bay, the FEMA standard storm surge model was used to simulate the coastal surge generated by any chosen storm (that is, any combination of the 5 storm parameters defined previously). By performing such simulations for a large number of storms, each of known total probability, the frequency distribution of surge height can be established as a function of coastal location. These distributions incorporate the large-scale surge behavior, but do not include an analysis of the added effects associated with much finer scale wave phenomena, such as wave height or runup. As the final step in the calculations, the astronomic tide for the region is then statistically combined with the computed storm surge to yield recurrence intervals of total water level (Reference 14).

The storm-surge elevations for the 10-, 50-, 100-, and 500-year floods have been determined for the City of Callaway and are shown in Table 3, Summary of Stillwater Elevations. The analyses reported herein reflect the stillwater elevations due to tidal and wind setup effects and include the contributions from wave action effects.

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CENTRAL PRESSURE DEPRESSION (MILLIBARS)	15.2	24.2	33.2	38.2	49.2	60.2	75.2	79.2
ASSIGNED PROBABILITIES	0.32	0.27	0.06	0.11	0.09	0.08	0.05	0.02
STORM RADIUS TO MAXIMUM WINDS (NAUTICAL MILES)	12			24			36	
PROBABILITY	0.23			0.50			0.27	
FORWARD SPEED (KNOTS)	7			13			19	
PROBABILITIES: ENTERING	0.46			0.36			0.18	
DIRECTION OF STORM PATH (DEGREES FROM TRUE NORTH)		138	ENTERING	167		196		225
PROBABILITY		0.25		0.23		0.27		0.25
FREQUENCY OF STORM OCCURENCE (STORM/NAUTICAL MILE/YEAR)	0.002213							

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TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CALLAWAY, FL

(BAY CO.)

PARAMETER VALUES FOR SURGE ELEVATIONS

FLOODING SOURCE AND LOCATION	TRANSECT	STILLWATER ELEVATION (FEET NGVD)			
		10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)
ST. ANDREW BAY					
Along shoreline of Pitts Bayou.	N/A	2.1	3.2	3.6	4.5
EAST BAY					
Along shoreline from about 0.25 mile west of South Gay Avenue to Callaway Bayou	1	2.3	3.6	4.1	5.3

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CALLAWAY, FL

(BAY CO.)

SUMMARY OF STILLWATER ELEVATIONS

ST. ANDREW BAY—EAST BAY

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3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the riverine sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Much of the cross-section data for the streams were obtained from topographic maps at a scale of 1:24000 with a contour interval of 2 meters (Reference 15). The underwater cross-section geometry, bridge geometry, and some cross sections near bridges were surveyed to get the necessary data. To obtain better definition of water-surface profiles along the streams, some cross sections were interpolated on the basis of field-surveyed cross sections and a topographic map (Reference 15); however, these cross sections are not shown in the study.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the Flood Boundary and Floodway Map.

Roughness coefficients (Manning's "n") were estimated by field inspection. Roughness values for the main channel ranged from 0.025 to 0.060, and flood plain values ranged from 0.100 to 0.150.

Starting water-surface elevations for Callaway Bayou Tributary were taken from mean high tide. For Martin Lake, starting water-surface elevations were taken from a rating curve developed downstream of Callaway.

Water-surface elevations on Martin Lake and Callaway Bayou for floods of the selected recurrence intervals were computed through use of the U.S. Geological Survey E-431 step-backwater computer program (Reference 16).

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals. In cases where the 50- and 100-year flood elevations are close together, due to limitations of the profile scale, only the 100-year profile has been drawn.

The hydraulic analyses for the riverine study are based only on the effects of unobstructed flow. The flood elevations shown on the profiles are, thus, considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Hydraulic analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding sources studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the shorelines.

The FEMA storm surge model was utilized to simulate the hydrodynamic behavior of the surge generated by the various synthetic storms. This model utilizes a grid pattern approximating the geographical features of the study area and the adjoining areas. Surges were computed utilizing grids of 5 statute miles and 1 statute mile.

Underwater depths and land heights for the model grid systems were obtained from topographic mapping at a scale of 1:24000 and a contour interval of 2 meters (Reference 15).

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The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in a report prepared by the National Academy of Sciences (Reference 17). This method is based on the following major concepts. First, depth-limited waves in shallow water reach a maximum breaking height that is equal to 0.78 times the stillwater depth. The wave crest is 70 percent of the total wave height above the stillwater level. The second major concept is that wave height may be diminished by dissipation of energy due to the presence of obstructions, such as sand dunes, dikes and seawalls, buildings, and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures prescribed in Reference 17. The third major concept is that wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to fetch length and depth.

Wave heights were computed along transects (cross-section lines) that were located along the coastal areas, as illustrated in Figure 3, Transect Location Map, in accordance with the "Users Manual for Wave Height Analysis" (Reference 18). The transects were located with consideration given to the physical and cultural characteristics of the land so that they would closely represent conditions in their locality. Transects were spaced close together in areas of complex topography and dense development. In areas having more uniform characteristics, they were spaced at large intervals. It was also necessary to locate transects in areas where unique flooding existed and in areas where computed wave heights varied significantly between adjacent transects.

Each transect was taken perpendicular to the shoreline and extended inland to a point where wave action ceased. Along each transect, wave heights and elevations were computed considering the combined effects of changes in ground elevation, vegetation, and physical features. The stillwater elevations for the 100-year flood were used as the starting elevations for these computations. Wave heights were calculated to the nearest 0.1 foot, and wave elevations were determined at whole-foot increments along the transects. The location of the 3-foot breaking wave for determining the terminus of the V zone (area with velocity wave action) was also computed at each transect. Table 4 provides a listing of the transect locations and stillwater starting elevations, as well as initial wave crest elevations.

TABLE 4 - TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS, AND INITIAL WAVE CREST ELEVATIONS

		Elevation (Feet)	
Transect	Location	Stillwater	Wave Crest
1	at the mouth of Callaway Bayou at East Bay	4.1	5.6

Figure 4 represents a sample transect that illustrates the relationship between the stillwater elevation, the wave crest elevation, the ground elevation profile, and the location of the A/V zone boundary.

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FIGURE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CALLAWAY, FL

(BAY CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

12

TRANSECT LOCATION MAP

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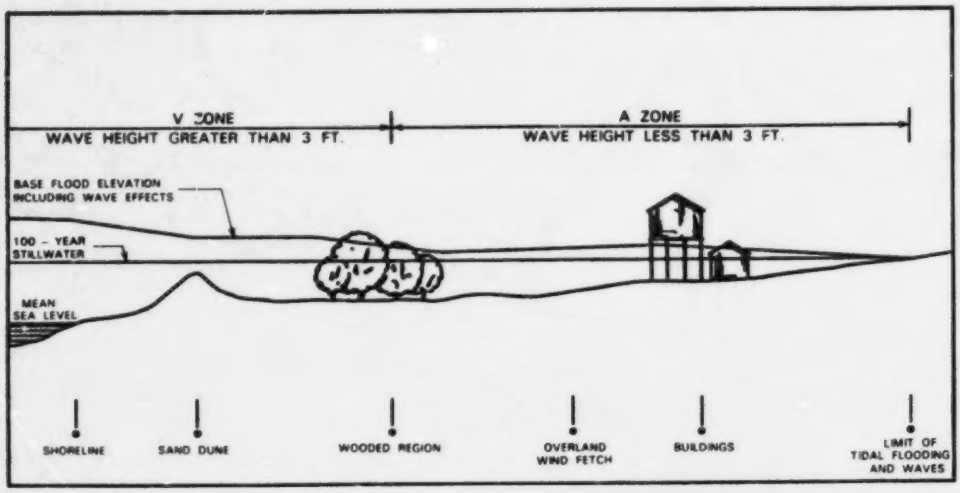

FIGURE 4 - Transect Schematic

After analyzing wave heights along each transect, wave elevations were interpolated between transects. Various source data were used in the interpolation, including topographic maps (Reference 15), aerial photographs (Reference 19), and engineering judgment. Controlling features affecting the elevations were identified and considered in relation to their positions at a particular transect and their variation between transects.

All elevations are referenced to the National Geodetic Vertical Datum of 1929. Elevation reference marks used in this study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study produces maps designed to assist communities in developing flood plain management measures.

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year flood plain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24000 and a contour interval of 2 meters (Reference 15). For each coastal flooding source studied in detail, the 100- and 500-year flood plain boundaries have been delineated using the flood elevations determined at each transect. Between transects, the boundaries were interpolated using the above referenced topographic maps.

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For the streams studied by approximate methods, only the 100-year flood plain boundary was delineated using the City of Callaway Type 15 Flood Insurance Study (Reference 2).

The 100- and 500-year flood plain boundaries are shown on the Flood Boundary and Floodway Map. In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on flood plains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood plain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed and are presented in Table 5, Floodway Data. No floodway was computed for Callaway Bayou Tributary downstream of Cherry Street due to the non-conveyant nature of the stream in that area.

As shown on the Flood Boundary and Floodway Map, the floodway boundaries were computed at cross sections. Between cross sections, the boundaries were interpolated. In cases where the floodway and the 100-year flood plain boundaries are either close together or collinear, only the floodway boundary has been shown. Portions of the floodway of Martin Lake and Callaway Bayou Tributary lie outside the corporate limits.

The area between the floodway and the 100-year flood plain boundaries is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 5.

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
CALLAWAY BAYOU TRIBUTARY								
H	7170	100	560	2.0	21.9	21.9	21.9	0.0
MARTIN LAKE								
A	8220[2]	280[3]	964	1.1	9.7	9.7	9.7	0.0
B	8940[2]	410[3]	4180	0.3	10.3	10.3	10.3	0.0

[1]FEET ABOVE BERTHE AVENUE
[2]FEET ABOVE U.S. ROUTE 98 (BUSINESS)
[3]WIDTH EXTENDS BEYOND CORPORATE LIMITS

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CALLAWAY, FL

(BAY CO.)

FLOODWAY DATA

CALLAWAY BAYOU TRIBUTARY—MARTIN LAKE

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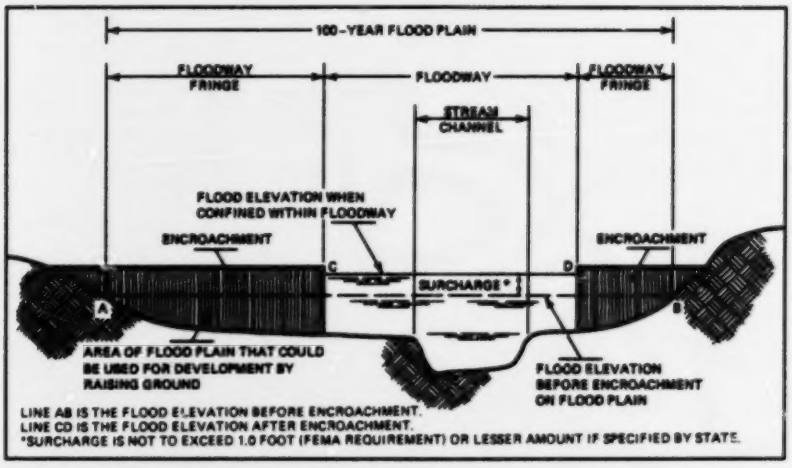
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE *
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FIGURE 5 - Floodway Schematic

The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

5.0 INSURANCE APPLICATION

To establish actuarial insurance rates, data from the engineering study must be transformed into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail affecting the City of Callaway.

5.1 Reach Determinations

For riverine studies, reaches are defined as sections of flood plain that have relatively the same flood hazard, based on the weighted average difference in water-surface elevations between the 10- and 100-year floods. This difference may not have a variation greater than that indicated in the following table for more than 20 percent of the reach:

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the riverine flooding sources of the City of Callaway are shown on the Flood Profiles and summarized in Table 6, Flood Insurance Zone Data.

In coastal areas, reaches are limited to the distance for which the 100-year flood elevation does not vary more than 1.0 foot. The location of these reaches are shown on the Flood Insurance Rate Map.

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5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is used to establish relationships between depth and frequency of flooding in any reach. This relationship is then used with depth-damage relationships for various classes of structures to establish actuarial insurance rate tables.

The FHF for a riverine reach is the weighted average difference between the 10- and 100-year flood water-surface elevations rounded to the nearest 0.5 foot, multiplied by 10, and shown as a 3-digit code.

The FHF for areas subject only to storm surge flooding is the difference between the 10- and 100-year stillwater elevations rounded to the nearest 0.5 foot, multiplied by 10, and shown as a 3-digit code. For areas with wave heights less than 3 feet, the FHF is the weighted average difference between the 100-year wave crest elevation and the 10-year stillwater elevation. For areas with wave heights greater than 3 feet, the FHF is determined using the difference between the 10- and 100-year stillwater elevations multiplied by 1.55, then rounded to the nearest 0.5 foot, multiplied by 10, and shown as a 3-digit code.

For example, if the difference between elevations is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference is greater than 10.0 feet, it is rounded to the nearest whole foot.

5.3 Flood Insurance Zones

Flood insurance zones and zone numbers are assigned based on the type of flood hazard and the FHF, respectively. A unique zone number is associated with each possible FHF and varies from 1 for a FHF of 005 to a maximum of 30 for a FHF of 200 or greater.

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations are shown or FHFs determined.
Zones A3-A6:	Special Flood Hazard Areas inundated by the 100-year flood, with base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between Special Flood Hazard Areas and the limits of the 500-year flood; areas that are protected from the 100- and 500-year floods by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and, areas subject to 100-year flooding from sources with drainage areas of less than 1 square mile. Zone B is not subdivided.

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Zone C: Areas of minimal flooding; not subdivided.

Flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community are shown in Table 6, Flood Insurance Zone Data, and Table 7, Coastal Flood Insurance Zone Data.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Callaway is, for insurance purposes, the principal product of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines for riverine flooding sources show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. For coastal flooding sources, the expected water-surface elevations of the base (100-year) flood are shown as a weighted average within zones. Each whole-foot elevation is delineated except where cartographic considerations require the combination of two or more elevation zones. The base flood elevations and zone numbers are used by insurance agents, in conjunction with structure elevations and characteristics, to assign actuarial insurance rates to structures and contents insured under the National Flood Insurance Program.

6.0 OTHER STUDIES

Type 19 Flood Insurance Studies are in progress for the Unincorporated Areas of Bay County and the City of Parker (References 1 and 20). The results of this study are in agreement with those studies.

A Type 15 Flood Insurance Study has been published for the City of Springfield (Reference 21). The results of this study are in agreement with the City of Springfield study.

Due to its more detailed analysis, this Flood Insurance Study supersedes the previously published Type 15 Flood Insurance Study for the City of Callaway (Reference 2).

7.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
CALLAWAY BAYOU TRIBUTARY							
REACH 1	0001	−2.5	−0.9	1.4	025	A5	VARIES—SEE MAP
MARTIN LAKE							
REACH 1	0001	−3.0	−0.4	1.8	030	A6	10

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CALLAWAY, FL

(BAY CO.)

FLOOD INSURANCE ZONE DATA

CALLAWAY BAYOU TRIBUTARY—MARTIN LAKE

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FLOODING SOURCE	TRANSECT	PANEL[1]	ELEVATION DIFFERENCE[2,3] BETWEEN 1.0% (100-YEAR) FLOOD AND 10% (10-YEAR)	FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3,4] (FEET NGVD)
ST. ANDREW BAY	N/A	0001,0002	−1.5	015	A3	4
EAST BAY	1	0001,0002	−2.0[5]	020	A4	4− 6

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE IN FEET
[3]ROUNDED TO NEAREST FOOT
[4]DUE TO MAP SCALE LIMITATIONS, BASE FLOOD ELEVATIONS SHOWN ON MAP MAY REPRESENT AVERAGE ELEVATIONS FOR THE ZONES DEPICTED
[5]INCLUDES EFFECTS OF WAVE ACTION

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CALLAWAY, FL

(BAY CO.)

COASTAL FLOOD INSURANCE ZONE DATA

20

ST. ANDREW BAY—EAST BAY

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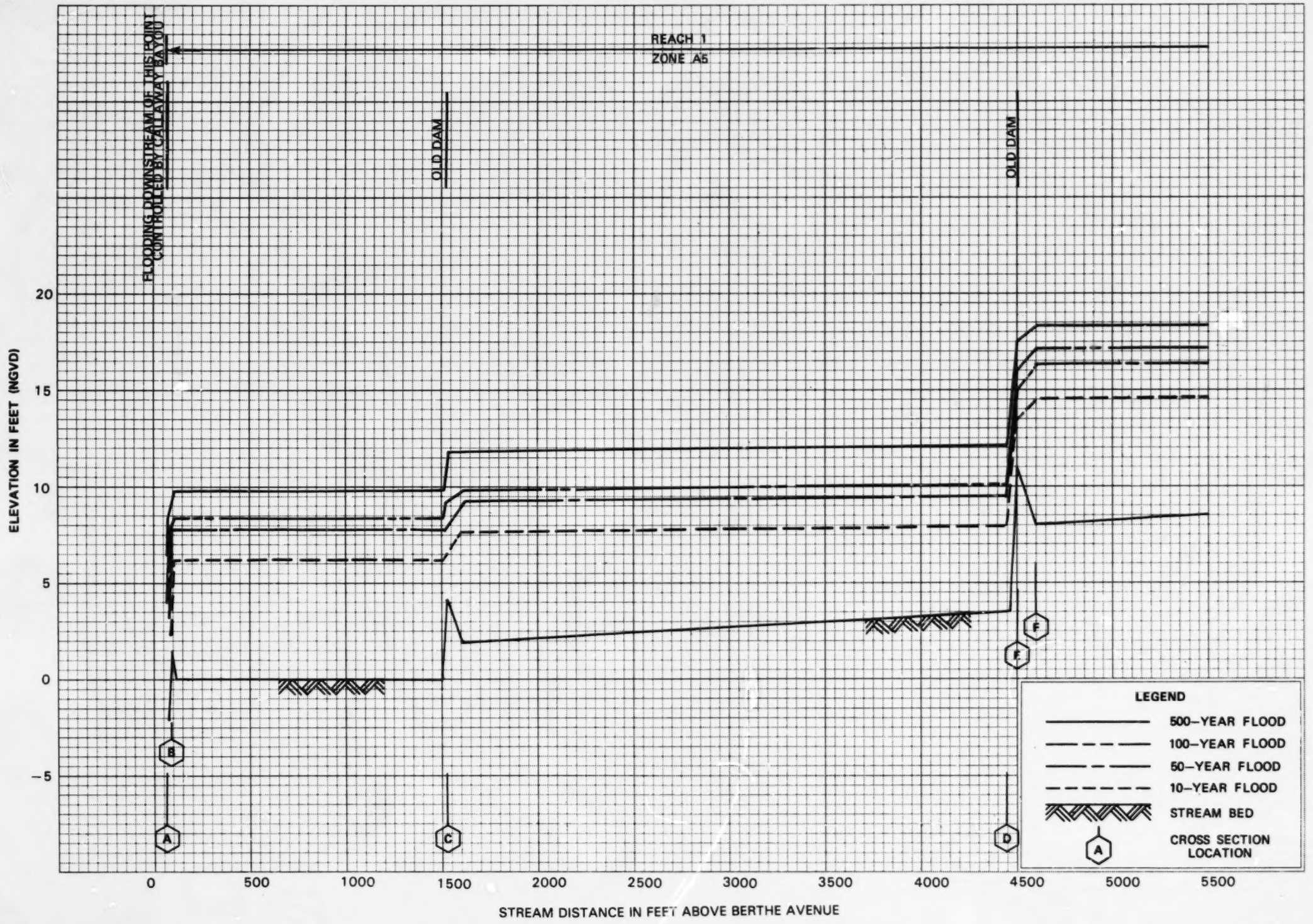

FLOOD PROFILES

CALLAWAY BAYOU TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CALLAWAY, FL

(BAY CO.)

01P

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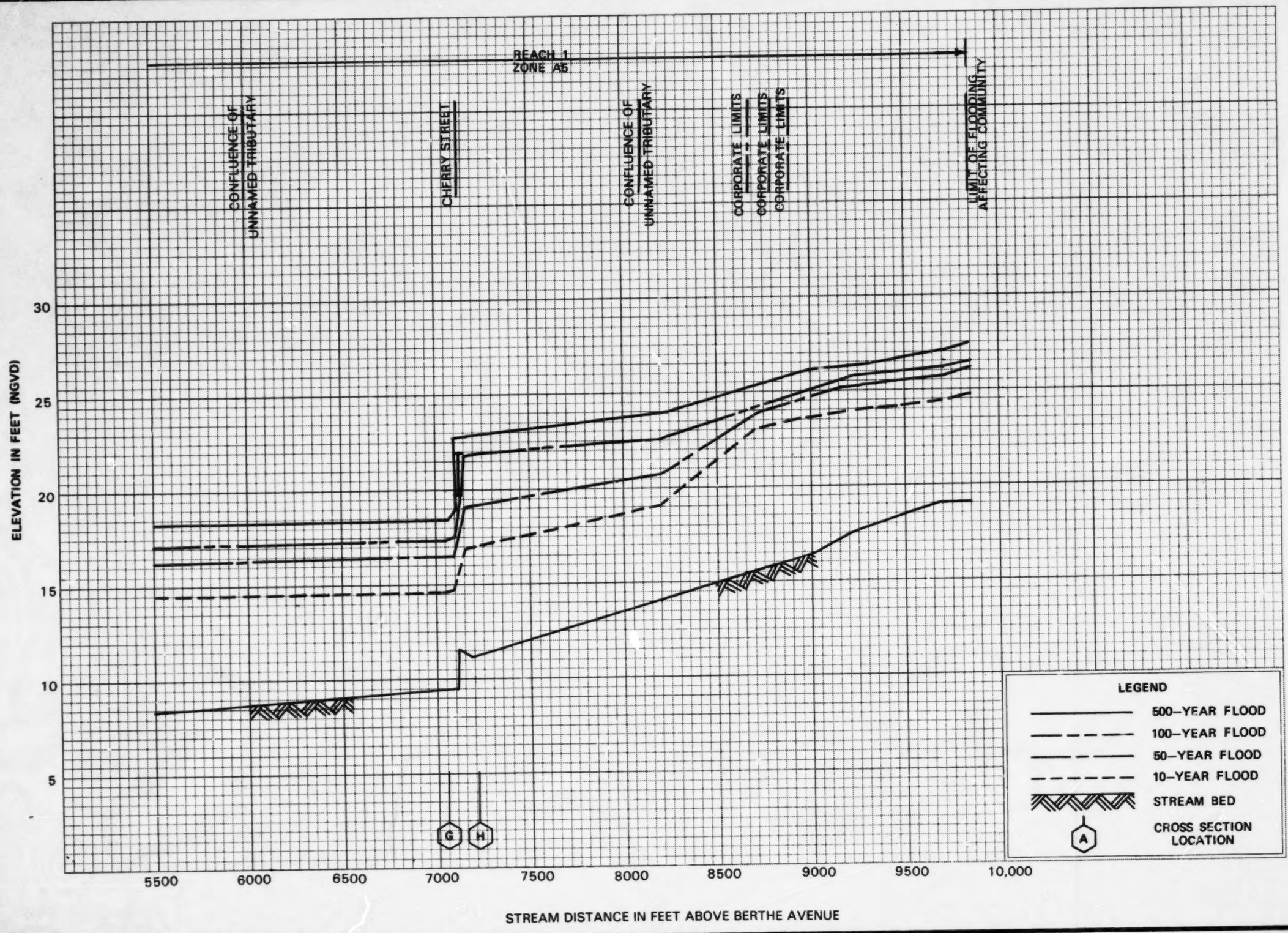

FLOOD PROFILES

CALLAWAY BAYOU TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CALLAWAY, FL
(BAY CO.)

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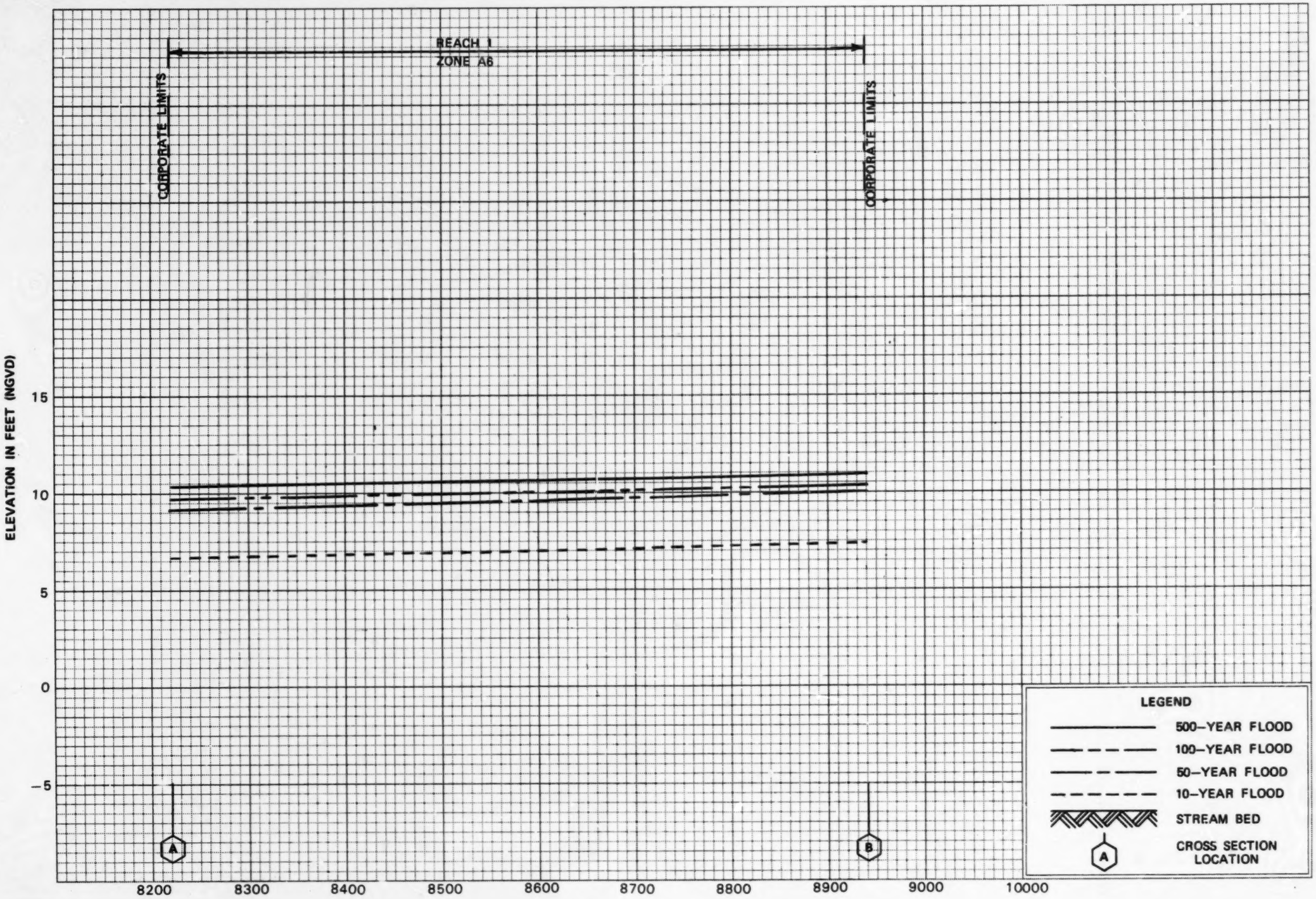

FLOOD PROFILES

MARTIN LAKE

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CALLAWAY, FL

(BAY CO.)

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